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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

ALEJANDRO MULERO, LUZ L

ART UNIT PAPER NUMBER

1763

DATE MAILED: 11/29/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/882,515

Applicant(s)

UHLENBROCK, STEFAN

Examiner

Luz L. Alejandro

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 8/12/05 (Board of Appeal decision).
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 31, 32 and 45-57 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 31, 32, 45-57 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### **DETAILED ACTION**

Upon consideration of the decision by the Board of Appeals and Interferences and the remand pursuant to the provisions of 37 CFR § 41.50 (a) (1) (2004), the following rejections are appropriate for the pending claims of the instant application.

#### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 45-56 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The improper Markush group language "consisting essentially of", in claims 45-56, renders the scope of the claims indefinite. This type of language appears to leave the associated claims open to elements other than those explicitly recited in the Markush groups. The applicant has not provided any indication of what these other elements (i.e. the elements not explicitly listed but encompassed by the language "consisting essentially of") may be. As such, one skilled in the art would not recognize what elements are encompassed by the claims, and thus the scope of the claims is indefinite. Please see MPEP 2173.05(h), which provides examples of proper Markush group language. The examiner suggests to amend the language of the claims by deleting the word "essentially" so that the phrase will read "consisting of".

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 31-32, 45-46, and 51-52 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted Prior Art (APA) in view of Frigo et al., US 5,232,869 and Freemantle (C&EN).

Applicant admits on page 8, line 24 of the specification that Fig. 1 shows a conventional apparatus. The conventional apparatus consists of an apparatus capable of vaporizing and transporting precursor molecules to a chamber capable of depositing a thin film on a substrate, the apparatus comprising: a vessel 42 capable of containing an ionic liquid; a carrier gas source 44 in fluid communication with the vessel 42; a bubbler device capable of bubbling a carrier gas through the vessel; a chamber 10 capable of deposition in fluid communication with the carrier gas source 44; and a gas line 45 capable of transporting carrier gas and vaporized precursor molecules from the vessel to the deposition chamber (see page 10-line 22 of specification to page 11-line 21).

APA art fails to expressly disclose an ionic liquid source, specifically, an ionic liquid source as recited in claims 45-46 and 51-52. Frigo teaches the use of a liquid with relatively low volatility (col. 4, lines 30-45) for vaporizing reactants for vapor deposition of a thin film on a substrate (i.e. chemical vapor deposition), wherein a

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precursor is dissolved in the liquid (i.e. the solvent) and passing (i.e. bubbling) a stream of gas through the liquid (col. 4, lines 59-64). Frigo does not specify that the liquid with low volatility used is an ionic liquid. However, Frigo clearly teaches the importance of using a liquid solvent having a vapor pressure lower than that of the precursor so that the liquid does not vaporize to any considerable extent and thus does not form a major constituent of the carrier gas leaving the bubbler (col. 3, lines 46-50 and col. 4, lines 59-62). In addition, while Frigo does teach several different liquids that can be used as solvents in the process (col. 4, lines 37-45), the liquids explicitly taught by Frigo are simply exemplary, and the invention of Frigo does not appear to be limited to such liquids. The important aspects of the liquid solvent of Frigo are that the liquid has a relatively low volatility, a melting point less than ambient temperature (i.e. the solvent is a liquid at ambient temperature), and a boiling point of at least 150°C, preferably at least 200°C (col. 4, lines 30-37). Freemantle teaches the use of ionic liquids "as solvents for a broad spectrum of chemical processes (page 32, col. 1). Freemantle also teaches that these ionic liquids have a low melting point, a large liquid range, have no measurable vapor pressure, and "are good solvents for a wide range of inorganic, organic and polymeric materials" (page 32 and page 33, col. 2). Importantly, the ionic liquids of Freemantle meet the criteria set forth by Frigo for solvents that can be used in the vapor deposition process (page 32, cols. 1-2). Therefore, in view of these disclosures, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the teachings of the APA as to comprise an ionic liquid source in the precursor vessel of the apparatus of the APA if the chemical vapor

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deposition method to be performed in the apparatus requires it for the following reasons. Frigo teaches that the solvent used "is a liquid of relatively low volatility" so that the solvent does not vaporize to any considerable extent and therefore does not form a major constituent of the carrier gas leaving the bubbler (col. 4, lines 30-31 and 59-62). As such, the vapor deposition process is not contaminated with unwanted solvent molecules picked up by the carrier gas. One of ordinary skill in the art would have used the ionic liquids taught by Freemantle in the process of Frigo with the reasonable expectation that, since the ionic liquids have no measurable vapor pressure, the ionic liquid solvents would not contaminate the process at all. In other words, by using ionic liquid solvents that have no measurable vapor pressure in the process of Frigo, one of ordinary skill in the art would have reasonably expected to advantageously further reduce the amount of liquid solvent entrained in the carrier gas (i.e. to maximize the positive teaching of Frigo that the liquid should not form a major constituent of the carrier gas leaving the bubbler). Also, one of ordinary skill in the art would have reasonably expected to reap another benefit of using an ionic liquid as a solvent in the process of Frigo, which is a reduction of air pollution obtained by using the non-volatile solvent (page 32, col. 1 of Freemantle). In addition, one would have reasonably expected that, since ionic liquids "are good solvents for a wide range of inorganic, organic and polymeric materials" (page 32 and page 33, col. 2) as taught by Freemantle, the precursors used in the process of Frigo (i.e. metals and metal organic complexes) would be successfully dissolved in the ionic liquid solvents of Freemantle. Furthermore, note that the apparatus of the APA modified by Frigo and Freemantle will

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comprise the ionic liquid source and will comprise a deposition chamber in fluid communication with the ionic liquid source to receive molecules from the ionic liquid source. Additionally, the combination of the apparatus of the APA modified by Frigo and Freemantle teaches the use of the ionic liquid sources of claims 45-46 and 51-52 (see, for example, the figure at the bottom of page 32).

Claims 47 and 53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Frigo et al., US 5,232,869 and Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Blomgren et al., U.S. Patent 5,188,914.

Admitted prior art, Frigo and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 47 and 53. Blomgren et al. discloses the use of the ionic liquid of claims 47 and 53 (see col. 2-line 49 to col. 3-line 5). Additionally, note that Freemantle teaches that, in ionic liquids, the cations, anions, and cation/anion pairs can be tailored to make an ionic liquid having solvent properties as desired by the user (page 33, col. 2). Therefore, in view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Frigo and Freemantle so as to comprise a source of the ionic liquid taught by Blomgren et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claims 48 and 54 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Frigo et al., US 5,232,869 and Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Jones et al., U.S. Patent 4,839,249.

Admitted prior art, Frigo and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 48 and 54. Jones et al. discloses the ionic liquid of claims 48 and 54 (see col. 2-lines 45-55). Additionally, note that Freemantle teaches that, in ionic liquids, the cations, anions, and cation/anion pairs can be tailored to make an ionic liquid having solvent properties as desired by the user (page 33, col. 2). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Frigo and Freemantle so as to comprise a source of the ionic liquid taught by Jones et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claims 50 and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Frigo et al., US 5,232,869 and Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Abdul-Sada et al., WO 95/21872.

Admitted prior art, Frigo and Freemantle are applied as above but fail to expressly disclose the specific ionic liquid of claims 48 and 54. Abdul-Sada et al. discloses the ionic liquid of claims 50 and 56 (see abstract). Additionally, note that



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Freemantle teaches that, in ionic liquids, the cations, anions, and cation/anion pairs can be tailored to make an ionic liquid having solvent properties as desired by the user (page 33, col. 2). In view of these disclosures, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Frigo and Freemantle so as to comprise a source of the ionic liquid taught by Abdul-Sada et al. depending upon the desired properties of the ionic liquid precursor and/or the particular process being conducted in the apparatus.

Claim 57 is rejected under 35 U.S.C. 103(a) as being unpatentable over Admitted prior art in view of Frigo et al., US 5,232,869 and Freemantle (C&EN) as applied to claims 31-32, 45-46, and 51-52 above, and further in view of Ballingall, III et al., U.S. Patent 4,911,101.

Admitted prior art, Frigo and Freemantle are applied as above but fail to expressly disclose a second vessel containing a second precursor in fluid communication with the chamber. Ballingall, III et al. discloses a first vessel 15 containing a first precursor and second vessel 35 containing a second precursor in fluid communication with the reaction chamber (see fig. 3 and col. 9-line 52 to col. 10-line 7). In view of this disclosure, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the apparatus of the Admitted prior art modified by Frigo and Freemantle so as to further comprise a second vessel containing a second precursor in fluid communication with the chamber as disclosed by Ballingall,

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III et al., because this would allow for the introduction of a first and a second precursor into the reaction chamber.

### ***Allowable Subject Matter***

Claims 49 and 55 would be allowable if rewritten or amended to overcome the rejection(s) under 35 U.S.C. 112, 2nd paragraph, set forth in this Office action.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Luz L. Alejandro whose telephone number is 571-272-1430. The examiner can normally be reached on Monday to Thursday from 7:30 to 6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Luz L. Alejandro', is positioned above the printed name.

Luz L. Alejandro  
Primary Examiner  
Art Unit 1763

November 23, 2005